NEW GUIDANCE DOCUMENT
ON
TRIBAL AMBIENT MONITORING

Updates to previous draft reviewed by NTAA;
Includes revisions for Sections IV, VII and XII
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U. S. Environmental Protection Agency
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New Guidance Document on Tribal Ambient Monitoring

(Note: See Appendix B for proposed alternative structure for Table of Contents)

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Section XII. The Tribal Perspective

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I. Purpose and Audience

A. Background on EPA's Tribal Air Monitoring Program

EPA's tribal air policy emphasizes that as sovereign governments, tribes set their own air program goals. Therefore, EPA's goal for the tribal air program is appropriately to help the tribes understand their air quality problems and to establish and meet their air quality goals, rather than to set goals or timetables for the tribes.

Tribes are diverse in their air quality problems, challenges, and capabilities. In addition, tribes often also face non-air risks to the health of their members -- as well as other challenges and disadvantages -- that are different from those facing non-tribal communities. Because of the diversity in situations and goals from tribe to tribe, EPA has taken the approach of delegating to the Regional Office level the tasks of assisting tribes in identifying their goals and the task of managing the available resources to help meet those goals. Because Regions understand individual tribal situations, effective decisions about funding and in-kind assistance are best made at the Regional Office level. Regional Offices have taken the initiative on helping tribes set air quality goals and design ambient monitoring to support them. Regions have prioritized requests from tribes when they collectively exceed the tribal air management grant funds available to the Regional Office. Regional Offices also negotiate, award, and manage grants to individual tribes. Regional Offices provide in-person, telephone, and written guidance and assistance to the tribal governments at all these stages. Technical training on the actual operation of monitors is available to tribes through the Tribal Air Monitoring Support (TAMS) Center, which is supported by a grant from EPA Headquarters. To date, Regional Offices and individual tribes have entered into grants that have dedicated a portion of the available tribal air management resources to plan, establish, and operate approximately [insert #] ambient air monitoring stations in Indian country.

In the course of this deliberately highly decentralized process, Headquarters and Regional Offices have prepared a limited body of strategic guidance on tribal air monitoring, i.e., guidance on deciding whether to monitor, what type of monitoring to do, and how EPA will prioritize requests for funding assistance. This guidance is rather general in nature, reflecting the need to accommodate the diversity of tribal situations.[1]

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[1] The available strategic guidance (excluding technical guidance on monitor operations and maintenance) includes the following documents, and perhaps others at the individual Regional Office level:

1. 4-page section titled "Tribal Air Quality Management" in the *Final National Program and Grant Guidance for Fiscal Years 2006-2008*, April 27, 2005.
2. Memo from Jeffrey R. Holmstead, "Criteria for Providing Funds to Tribes from the State and Tribal Grant Assistance Appropriation for 103 and 105 Grants," January 27, 2005.
3. **"**MENU ITEM**:** Air Quality Monitoring Activities**,"** in *The Tribal Air Grant Framework - A Menu of Options For Developing Tribal Air Grant Work Plans and Managing Grants for Environmental Results*, September 2004. http://yosemite.epa.gov/R10/AIRPAGE.NSF/283d45bd5bb068e68825650f0064cdc2/e34950b285534aa988256dfe0063be55/$FILE/The%20TRIBAL%20AIR%20GRANTS%20FRAMEWORK%20final.pdf
4. Guidance for Conducting: TRIBAL AIR QUALITY ASSESSMENTS, U.S. EPA Region 10, April 15 2005.

In addition to this limited body of strategic guidance, tribes have access to the large body of EPA guidance on monitoring technologies, quality assurance, and data management. While originally prepared for use by state and local government agencies, this technical guidance is equally applicable to monitors in tribal settings.

B. Purpose of this Guidance Document

This guidance document is not intended to modify any existing EPA policies on tribal air quality management. The intended purpose of this guidance document is to improve the ability of tribes and regional offices to prioritize monitoring resources and to accomplish the following:

- (1) ensure that tribal goals for tribal air monitoring projects are clearly stated and documented in grant agreements (or other suitable forms) before resources under EPA management are applied, that progress in meeting those goals is tracked, and that tracking results are used to make adjustments when appropriate.

Do we want to imply that regions are not applying standards consistently?

- (2) serve as a useful information resource for tribes as they determine their need for monitoring, work plans and grant applications, as well as a one stop resource for locating technical information.

- (3) assist tribes to understand monitoring data.

How do we do this?

- (4) help integrate and coordinate tribal and state/local/national monitoring strategies and activities.

How? What does this mean? Section 4?

- (5) Recognize the need for flexibility to address the unique needs of individual tribes.

Is this a separate point? Put in intro?

C. Audience

The intended audiences for this document are tribal environmental professionals and EPA Regional Office and Headquarters staff who are involved in resource allocations, tribal air grant award and management, program evaluation, strategic planning of monitoring networks, or technical support to monitoring programs. State monitoring officials may also benefit from reading this document, as it may improve their understanding of tribal goals and how EPA strives to help tribes meet their goals. This

should allow them to collaborate more efficiently with tribes whenever collaboration serves state and tribal objectives.

This section is OK. If we adopt Bill's proposed new organization then we need to make sure the new organization addresses different audiences.

D. Relationship to EPA's Strategic Plan, Budget, and Program Assessment Process

EPA's Strategic Plan for 2003-2008 contains this statement regarding EPA's commitment to work with tribes:

> EPA is committed to working with tribes on a government-to-government basis to develop the infrastructure and skills tribes need to assess, understand, and control air quality on their lands. We will increase air monitoring in Indian country, and, in consultation with tribes, we will establish needed federal regulatory authorities and help tribes develop and manage their own air programs in a manner consistent with EPA Indian Policy and tribal traditions and culture. We plan to complete a policy determining when Federal Implementation Plans are appropriate for bringing Clean Air Act programs to Indian country. We will support tribal air programs by providing technical support, assistance with data development, and training and outreach, and we will help tribes participate in discussions of national policy and operations and in regional planning and coordination activities. Where tribes choose not to develop their own programs, we will implement air quality programs directly.

In developing its annual budget plans, EPA considers whether sufficient resources are available to support tribal air monitoring that is necessary and appropriate to protect air quality in Indian country or to provide important data that helps meets state, local, or national monitoring data needs. Each year, EPA's budget request to Congress requests a certain amount of funding for use in giving to grants to tribes to support air quality management. For the last several years, Congress has appropriated about $11 million for this purpose.[2] It has become apparent that increasing numbers of tribes are interested in establishing monitoring stations, and that not all interested tribes will be able to obtain EPA financial support for ambient air monitoring if resources for tribal air quality management remain steady. Many if not all Regional Offices report that already they are not able to meet all requests to provide grant funds for tribal air monitoring. Other than reporting this situation, this guidance document is not intended to examine or make

[2] In FY2005, EPA proposed to Congress that there be separate amounts of air grant funding for states and tribes. EPA observes these two separate ceilings in its operating plan under the enacted FY2005 budget. EPA has proposed the same separation for FY2006, and EPA has issued grant and technical guidance for FY2006 based on this separation. In FY2005, $ 11.1 million is available for tribal air management, see http://www.epa.gov/ocfo/budget/2005/2005bib.pdf. The proposed FY2006 budget provides $ 11 million, see http://www.epa.gov/ocfo/budget/2006/2006bib.pdf.

recommendations regarding the overall level of EPA funding and in-kind support to tribal air quality management. EPA considers this and other budget issues through other processes. The experience of working across Headquarters and Regional Office and with tribal professionals in the course of preparing this guidance document [will/has] better informed EPA staff about the tension between resources and needs, and will inform EPA budget decision-makers in future years.

The Office of Management and Budget (OMB) on a regular basis assesses EPA's Air Program to determine how well each part of the Air Program is managed in terms of having appropriate, and well defined goals; applying resources towards those goals; providing guidance to partners who help meet the goals; having systems in place to observe how well the goals are met; and making adjustments in the program when necessary to reach those goals. In addition to meeting OMB expectations, this "goals and feedback" model is just good common sense because it helps make sure that limited resources are used in ways that best meet the right goals. Programs that are found by OMB to have serious weaknesses in management are asked to make corrections and face the possibility of funding reduction in future year budget proposals to Congress.

The most recent round of review of the NAAQS air quality program by OMB has made EPA managers and staff more conscious about the importance of being able to document that the tribal assistance portion of the Air Program meets OMB measures and goals, guides participants to meet those goals, tracks progress, and make adjustments when needed. This guidance document on tribal air monitoring is a new part of such documentation.

It should be noted that unlike most EPA programs, the goals of the tribal air monitoring program have been set by the Regional offices and tribes with general guidance from Headquarters and OAQPS. A result is that people inside and outside of EPA who are not personally involved in working with tribes on monitoring projects need the benefit of reporting systems to be able to be aware of and assess what is being accomplished with available resources. The preparation of this document represents one cycle of such assessment and reporting, in that current and recent tribal air monitoring programs are reviewed in Section IV.

E. The Tribal Perspective

EPA received comment from NTAA and tribal professionals in October on the 11/05 draft. As a result of the comments received, we divided the Guidance effort into two documents: (1) EPA Guidance to identify and prioritize resources related to tribal air quality, and (2) Monitoring Guidance for tribes. The Tribal perspective section will appear in both documents.

Both documents convey EPA guidance and reflect EPA policies and both will be developed by a workgroup that include tribal environmental professionals. EPA has opened the development of this document to all interested tribal environmental professionals to assist us to make a document that takes into account tribal input and is meaningful to tribes, as well as to EPA. To ensure that tribal views are represented, particularly if they are not the same views as those represented in this document, we are at various points in the document delineating text blocks which will offer comment or reaction from the tribal perspective. These passages are provided by tribal environmental professionals and NTAA and do not represent EPA policy or guidance, but may be useful to some or all readers of this document.

II. Guidelines for EPA Support for Tribal Air Monitoring

This section states the guidelines that EPA applies in its air monitoring work with tribes. The purpose of listing them here is to promote understanding and observance of the principles by EPA staff, and to help tribes anticipate and understand the basis for future EPA actions. Most of these principles flow from the Clean Air Act, the EPA Indian Policy, the Tribal Air Rule, and other existing law and EPA rules and policies on budget, quality assurance, ambient monitoring, etc. The wording of these principles was the subject of the first few conference calls among the project participants. Individual EPA Regional Offices may have their own guidelines or grant criteria. In the course of developing this guidance document, Regional Offices reviewed their guidelines to ensure they did not conflict with those stated here. The guidelines include the following:

a. EPA has a responsibility to relate to each tribe on a government-to-government basis, and should act in the tribe's best interest. To the extent possible, EPA should also take into account the tribe's preferences. EPA is obligated to consult with tribes at an appropriate level. Input from tribal environmental professionals was obtained starting at an early point in the development of this guidance/strategy. However, EPA's consultation responsibilities may require continued discussions between tribal leaders and appropriate EPA staff or management

b. Tribes set their own air quality goals. EPA strives to assist them in doing so and in determining how monitoring can help clarify and/or accomplish those goals.

c. Monitoring supported by EPA grant funds should always be for the identified purpose of characterizing and/or managing specific known or suspected short term and/or long term risks to environmental values that depend on maintaining or restoring good air quality, including:
   i. Human health risks (including informing exposed persons about the level of their exposure)
   ii. Ecological risks
   iii. Cultural resources and values, including those related to visibility.

d. EPA and each tribe receiving funding to conduct monitoring should reach a clear understanding, before operations commence, of the duration of the funding or the timing and process for future decisions regarding continuation of the funding. There needs to be periodic re-evaluation of the need for and value of ongoing monitoring, for example on a three- to five-year cycle.

e. EPA should support tribal capacity building, for example, by helping to develop the capabilities of tribal staff. Contractor support may be necessary and appropriate in some situations, but generally is not the preferred approach to carrying out monitoring. In the area of ambient monitoring, capability includes development of monitoring objectives, development of quality assurance plans, installation and operation of the monitors, execution of quality assurance plans, data handling, and understanding the implications of the observed ambient concentrations. EPA should seek to allow a tribe sufficient support and opportunity to

progress through these stages.

f. EPA has limited resources in its enacted budget to help pay for tribal air quality management in general. EPA is therefore unable to support all monitoring in Indian country that may have value to the affected tribes.

g. There needs to be consistency/fairness across tribes, but also flexibility to hear and if appropriate to address unusual or unexpected tribe-specific situations.

h. Decisions affecting specific tribes should be made at a level where individual situations can be appreciated.

i. EPA should encourage all parties to take advantage of all available data on ambient air quality where technically relevant. Operating monitors may provide useful information on air quality some distance from their location and information on transport into and out of state and tribal lands.

j. Tribes should have equal opportunity to participate in programs that are not inherently tied to state/tribe distinctions, and to benefit from resources used to support those programs, where such access is consistent with program goals.[3]

k. Grant procedures and grant performance must comply with applicable laws and regulations.

l. EPA will work with tribes to ensure that there is timely EPA and public access to data collected with federal funds. EPA will need to explain the significance and need for this access to tribes generally and to each grant recipient. EPA should help tribes understand the significance of their data quickly so tribes are never less aware than others of the data and the data's implications.

m. This EPA guidance does not limit any tribe's right to monitor for whatever air pollutants it chooses in its own portion of Indian country.

[3] For example, EPA's CASTNet monitoring program is intended to monitor acid deposition across broad areas for the purposes of broad national objectives. Operation of CASTNet is funded separately from the state and tribal air grant (STAG) funds. Some CASTNet sites are currently located in Indian country. As new sites are contemplated, tribal lands in the right areas of the country to support the monitoring goals should be considered equally with state and federal lands.

III. Background for Planning Tribal Air Monitoring

Introduction

This section contains background on the Clean Air Act, other relevant laws, regulations, and policies, and other information that is not specifically about tribal air monitoring. It is intended to assist tribal professionals who are not already familiar with this material, so that they can participate more easily and effectively with EPA staff. To save space and time, this section consists of thumbnail sketches and pointers to other documents for fuller descriptions. In order to be brief and understandable to tribal professionals unfamiliar with the history and complexity of air pollution law, policy, history, and technology, the thumbnail sketches are simplified and do not convey all provision or nuances. They assist tribal staff in understanding the more detailed references, and in discussing these topics with EPA specialists and more experienced tribal professionals. Additional substantial amounts of information concerning (1) the Clean Air Act and associated EPA rules, (2) government policies, program planning, budgets and grants, (3) technical issues related to monitoring, emissions inventories and air data, and (4) health-related topics can be found by working through the following Internet addresses:

Clean Air Act -- http://www.epa.gov/air/caa/
Chief Financial Officer (EPA) -- http://www.epa.gov/ocfo/index.htm
Tribal Air (EPA/OAR) -- http://www.epa.gov/air/tribal/
American Indian Environmental Office (EPA)--
http://www.epa.gov/indian/index.htm
Northern Arizona University -- http://www4.nau.edu/
Technology Transfer Network (EPA/OAR) -- http://www.epa.gov/ttn/

A. EPA's Planning and Budgeting

EPA's Strategic Plan serves as the Agency's road map for 5 year periods. The plan is intended to lay out long-term goals, as well as annual goals that will need to be met along the way. It helps EPA to measure how far it has come towards achieving goals and to recognize where approaches or directions need adjustment to achieve better results. Finally, it provides a basis from which EPA's managers can focus on the highest priority environmental issues and ensure the best use of resources. Strategic Plans were released in 1997, 2000 and 2003. A plan for the period 2006 – 2011 is in preparation. A significant goal of the new plan is to build on recent advances in strengthening joint regional/state/tribal planning.

The Strategic Plan is supplemented by National Program Manager Guidance and Regional Plans to accomplish goals associated with individual media, e.g., air, including guidance on grants. The grant guidance specifically addresses funding for tribes and their monitoring programs. For each fiscal year (which runs from October through September), EPA also develops a budget which defines the goals and objectives towards which the Agency intends to work within the fiscal year and the funding necessary to accomplish these goals and objectives. The budgeting process includes a summary of

EPA's budget, an annual performance plan, a Congressional justification, and appropriate links to congressional funding bills.

Also, under the Government Performance and Results Act (GPRA), an Annual Report which serves as the Agency's program performance report highlights the Agency's environmental, programmatic, and financial performance for each fiscal year. Progress in meeting annual performance goals for which data are available is documented, including that contributed by tribal partners. Useful Internet links to all of this information includes:

-- http://www.epa.gov/ocfopage/plan/plan.htm
-- http://www.epa.gov/ocfo/npmguidance/index.htm
-- http://www.epa.gov/cfo/npmguidance/oar/2005/oar_finalnpmguide.pdf
-- http://yosemite.epa.gov/R10/AIRPAGE.NSF/283d45bd5bb068e68825650f0064cdc2/e34950b285534aa988256dfe0063be55/$FILE/The%20TRIBAL%20AIR%20GRANTS%20FRAMEWORK%20final.pdf
-- http://www.epa.gov/ocfopage/budget/index.htm
-- http://www.epa.gov/ocfo/finstatement/apr.htm

B. Relevant CAA provisions

Section 301(d) of the Clean Air Act specifically authorizes EPA to treat Indian tribes as States under the Act. In turn, the EPA Administrator must promulgate regulations specifying those provisions of this Act for which it is appropriate to treat Indian tribes as States. These regulations establish requirements that Indian tribes must meet if they choose to seek such treatment, and provides for awards of federal financial assistance to tribes to address air quality problems. A range of related policies and initiatives have also evolved over time with regard to Indian tribes. In particular, the following documents are relevant: the EPA Indian Policy, the Tribal Air Rule, and the draft document "Implementing the Clean Air Act in Indian Country". Associated legislative, regulatory and policy documentation is provided at the following Internet addresses:

Clean Air Act and Tribes
-- http://www.epa.gov/air/tribal/tar.html
-- http://www.epa.gov/air/caa/caa301.txt
-- http://www.epa.gov/fedrgstr/EPA-AIR/1998/February/Day-12/a3451.htm

EPA Indian Policy
-- http://www.epa.gov/indian/policyintitvs.htm
-- http://www.epa.gov/indian/pdfs/indian-policy-leavitt-pr.pdf

Tribal Air Rule
-- http://yosemite.epa.gov/r10/airpage.nsf/16388b0c5db97d0088256b58005f8de5/94f65e27af63d505882569530077ae73!OpenDocument

Implementing the Clean Air Act in Indian Country

-- http://www.epa.gov/air/tribal/1997Caaimp.pdf

C. The January 27, 2005 Holmstead memo on criteria for award of tribal air grants

This document set forth criteria for the air program to use when reviewing and assessing tribal requests for grants under the State and Tribal Assistance Grants (STAG) appropriation. Two overriding factors and four additional criteria for reviewing and assessing tribal requests for FY05 STAG grants are identified, including significant air quality related health concerns and environmental/cultural resource concerns as overriding factors, plus programmatic commitment and leadership, prior grant performance, location relative to essential data, and commitment to air quality issues. The complete document is available at the following Internet address:

-- HolmsteadTAG_012705.doc

D. Tribal Environmental Agreements

A template for EPA/Tribal Agreements was prepared to establish "workplans" between the Regions and Tribes to develop environmental protection in Indian country. The Agreements should reflect the need for development by partnership, flexibility, and re-visitation through a common set of principles and consistent factors. The Agreements should respect the sovereignty and legal status of tribes. These Agreements are a critical next step to further developing environmental protection in Indian country. To effectively evaluate the need for Tribal program development in a consistent manner as well as provide a benchmark against which to measure progress over time, the following outline has been suggested: Preamble/Introduction, Draft EPA/Tribal Agreement Template, Purpose for Establishing EPA/Tribal Agreements, Guiding Principles, General Agreement on Region-wide Tribal Issues, Planning and Budget Cycles, and (Name of Tribe)/EPA Specific Action Plan. Specifics of tribal agreements can be found at the following Internet address:

-- http://www.epa.gov/indian/agree.htm

E. The existing state/local/other monitoring networks: types, purposes, history, funding

To preserve and improve the quality of the nation's air, it is necessary to evaluate the status of the atmosphere as compared to clean air standards and historical information. Ambient air monitoring programs make such assessments possible. A review of the various air monitoring networks (e.g., SLAMS, NAMS, PAMS, SPMS, including tribal monitoring) is provided as part of the National Ambient Air Monitoring Strategy. That strategy and other relevant information on monitoring networks, including tribal programs, are provided at the following Internet addresses:

-- http://www.epa.gov/ttn/amtic/files/ambient/monitorstrat/allstrat.pdf
-- http://www.epa.gov/oar/oaqps/qa/monprog.html#Ambient

-- http://www.epa.gov/oar/oaqps/montring.html
-- http://www.epa.gov/ttn/amtic/amlinks.html
-- http://vista.cira.colostate.edu/improve/Default.htm
-- http://www.epa.gov/air/tribal/tribetotribe.html

F. The AMTIC Internet website

The Ambient Monitoring Technology Information Center (AMTIC) Internet website is operated by EPA's Ambient Air Monitoring Group (AAMG). AMTIC contains information and files on ambient air quality monitoring programs, details on monitoring methods, relevant documents and articles, information on air quality trends and nonattainment areas, federal regulations related to ambient air quality monitoring, as well as information on monitoring training, contacts and related Internet sites. The AMTIC Internet address is:

-- http://www.epa.gov/ttn/amtic/

G. The draft National Ambient Air Monitoring Strategy and related rulemaking

The overarching goal of the draft National Ambient Air Monitoring Strategy is to improve the scientific and technical competency of the nation's air monitoring networks while increasing our ability to protect public and environmental welfare; and to accomplish this in flexible ways that accommodate future needs in an optimized resource constrained environment. Objectives in achieving this broad based goal include: manage the Nation's air monitoring networks, establish a new air monitoring approach, provide a greater degree of timely public air quality information, improve network efficiencies, foster the utilization of new measurement method technologies, encourage multi-pollutant measurements, provide a base air monitoring structure, develop and implement a major public information and outreach program, seek input from the scientific community, provide air monitoring platforms and data bases, and assess funding levels needed to maintain support for this monitoring strategy. The impact of this strategy on tribal monitoring is also addressed, including operation of monitoring sites by Tribes. The draft monitoring strategy document (4/24/04) and supporting documents that both provide a description of the strategy and reflect ongoing components of the strategic plan development are available at the following Internet addresses:

-- http://www.epa.gov/ttn/amtic/monstratdoc.html
-- http://www.epa.gov/ttn/amtic/monitor.html

H. QA requirements, example QAPPs, resources for developing QAPPs

EPA uses its Quality System to manage the quality of environmental data collection, generation, and use; the primary goal is to ensure that data are of sufficient quantity and quality to support decisions for protecting the public and the environment. The Ambient Air Monitoring Quality Assurance program applies these principles to air quality data. This is accomplished through effective communication and cooperation with monitoring

organizations, which include EPA, State, Local, Tribal agencies, the academic community and industry. The following QA tools are routinely provided: Guidance Documents, The National Performance Evaluation Program, Data Quality Assessments and Reports, Ambient Air Quality Assurance Training, and example QAPP's. Information on QA requirements and examples of applications are available at the following Internet addresses:

-- http://www.epa.gov/quality/index.html
-- http://www.epa.gov/airprogm/oar/oaqps/qa/index.html
-- http://www.epa.gov/ttn/amtic/quality.html
-- http://www.epa.gov/ttnamti1/files/ambient/airtox/nattsqapp.pdf

I. Data systems for ambient air measurements (AQS, other)

The Air Quality System (AQS) is EPA's widely used repository of ambient air quality data. AQS stores data from over 10,000 monitors, 5000 of which are currently active. State, Local and Tribal agencies collect the data and submit it to AQS on a periodic basis. A detailed description of AQS, supporting manuals and guides, web-based access, information on training, and links to other sources of air quality information, including S/L/T agencies in provided at the following Internet address:

-- http://www.epa.gov/ttn/airs/airsaqs/

J. Availability of ITEP and TAMS support

The Internet home page for the Institute for Tribal Environmental Professionals (ITEP) states that "ITEP was established in 1992 to assist Indian Tribes in the management of their environmental resources through effective training and educational programs."

The Internet home page for the Tribal Air Monitoring Support Center states that "The Tribal Air Monitoring (TAMS) Center was created through a partnership between Tribes, the Institute for Tribal Environmental Professionals and the United States Environmental Protection Agency. It is the first technical training center designed specifically to meet the needs of tribes involved in air quality management and offers an array of training and support services to Tribal air professionals. The TAMS Center mission is to strive to develop tribal capacity to assess, understand and prevent environmental impacts that adversely affect health, cultural, and natural resources."

Listings of training programs and services are provided respectively at the following Internet addresses:

-- http://www4.nau.edu/itep/
-- http://www4.nau.edu/tams/

K. Availability and role of "benchmarks" for health and ecosystem effects

Air Quality indicators, concentrations of criteria pollutants relative to the NAAQS, effects on health due to toxic air pollutants, and other ambient measures such as visibility and acid deposition, all provide benchmarks of the nation's air quality. The 2003 Report on the Environment makes extensive use of indicators in assessing the status of health and ecosystem effects; preparation of a report that reflects 2006 has begun. The Report on the Environment, and associated information on criteria and toxic air pollutants, is available at the following Internet addresses:

-- http://www.epa.gov/indicators/index.htm
-- http://www.epa.gov/indicators/roe/html/roeTOC.htm
-- http://www.epa.gov/ttn/naaqs/
-- http://www.epa.gov/iris/index.html
-- http://www.epa.gov/ttnatw01/hlthef/hapindex.html
-- http://www.epa.gov/air/toxicair/index.html
-- http://www.epa.gov/air/visibility/index.html
-- http://www.epa.gov/airmarkets/cmprpt/arp03/summary.html

L. National Emissions Inventory

The National Emissions Inventory (NEI) is a national data base of air emissions information with input from numerous State and local air agencies, from tribes, and from industry. This data base contains information on stationary and mobile sources that emit criteria air pollutants and their precursors, as well as hazardous air pollutants (HAPS). The data base includes estimates of annual emissions, by source, of air pollutants in each area of the country, on an annual basis. Emissions estimates for individual point or major sources (facilities), as well as county level estimates for area, mobile and other sources, are available currently for 1990 and 1996 through 1999 for criteria pollutants, and for 1999 for HAPs. A final version of the 2002 NEI will be ready in December 2005.

Four of the six criteria pollutants are included in the NEI data base: CO, NOx, SO2, and PM10 and PM2.5. The NEI also includes emissions of VOC, which are ozone precursors, emitted from motor vehicle fuel distribution and chemical manufacturing, as well as other solvent uses. VOCs react with NOx in the atmosphere to form ozone. Ammonia (NH3) is an additional pollutant included in the NEI. The NEI data base defines three classes of criteria air pollutant sources, e.g., point, area, and mobile.

Hazardous air pollutants, also known as toxic air pollutants, are those pollutants that are known or suspected to cause serious health problems. Section 112 of the Clean Air Act (CAA) currently identifies a list of 188 pollutants as HAPs. The list of HAPs includes relatively common pollutants such as formaldehyde, chlorine, methanol, and asbestos, as well as numerous less common substances. The NEI data base includes emission estimates for the 188 HAPs from stationary major and area sources and mobile sources, as defined in the Clean Air Act (CAA). The NEI includes three classes of HAP emission sources: Major, Area and Other, and Mobile.

More information about the NEI data base and the compilation of criteria pollutant and HAP emissions inventories, and links to the data base, are available at the following Internet addresses:

-- http://www.epa.gov/ttn/chief/net/index.html
-- http://www.epa.gov/ttn/chief/eiinformation.html

M. National Air Toxics Assessment

The National Air Toxics Assessment (NATA) is a national-scale assessment of 33 air pollutants (a subset of 32 air toxics on the Clean Air Act's list of 188 air toxics plus diesel particulate matter (diesel PM)). The assessment includes four steps that look at the year 1996:

1. Compiling a national emissions inventory of air toxics emissions from outdoor sources.
2. Estimating ambient concentrations of air toxics across the contiguous United States.
3. Estimating population exposures across the contiguous United States.
4. Characterizing potential public health risk due to inhalation of air toxics including both cancer and non-cancer effects.

The goal of the national-scale assessment is to identify those air toxics which are of greatest potential concern, in terms of contribution to population risk. The results will be used to set priorities for the collection of additional air toxics data (e.g., emissions data and ambient monitoring data). Note: As of May 2002, the results posted for all four steps include revisions based on input from scientific peer review. Results are available at the following Internet address:

-- http://www.epa.gov/ttn/atw/nata/

N. Air quality modeling methods and tools, in particular how they may be able to give insight into air quality in Indian country when ambient monitoring is not available

There are three types of air quality models: dispersion, photochemical, and receptor models used in assessing control strategies and source impacts. Source code and associated user's guides and documentation are routinely provided for preferred/recommended models, screening models, and alternative models. In addition, guidance if provided for applying air quality models for regulatory applications for both State Implementation Plans (SIP) demonstrations and revisions, as well as permit applications for new source reviews, including Prevention of Significant Deterioration (PSD) regulations. These latter applications are particularly relevant for estimating air quality impacts in Indian country. Also available is the Model Clearinghouse which is designed to help record the interpretation of modeling guidance for specific regulatory applications. Modeling contacts within the EPA Regional Offices and State

environmental agencies are available. Detailed information on models, codes and guidance in their use is available at the following Internet addresses:

-- http://www.epa.gov/ttn/scram/
-- http://www.epa.gov/scram001/tt22.htm
-- http://www.epa.gov/scram001/tt25.htm

O. Indoor air issues including radon and mold

Radon and mold can both be problems in indoor environments. Radon is odorless and tasteless, but may exist at ambient air levels that exceed safe limits in homes. Air containing radon that is breathed indoors is the second leading cause of lung cancer in the United States today. Likewise, molds are part of the natural environment and are produced by means of tiny spores. Mold may begin growing indoors when mold spores land on surfaces that are wet. Molds can gradually destroy the things they grow on, but damage to homes and furnishings can be prevented and potential health problems avoided by controlling moisture and eliminating mold growth. Internet addresses with additional information on radon and mold, associated effects, and mitigation strategies are available at the following Internet addresses:

-- http://www.epa.gov/iaq/index.html
-- http://www.epa.gov/mold/index.html
-- http://www.epa.gov/radon/index.html
-- http://www.epa.gov/iaq/atozindex.html

P. The New Source Review and PSD programs and their relationship to monitoring needs

The New Source Review (NSR) permitting program applies to new major stationary sources and major modifications locating in areas designated as nonattainment for the NAAQS. The Prevention of Significant Deterioration (PSD) permitting program applies to new major stationary sources and major modifications locating in areas designated as attainment or unclassifiable for the NAAQS. These programs generally require the permit applicant to conduct a source impact analysis, using monitored data and air quality models. For the NSR program, the impact analysis must demonstrate that the new or modified source will not cause or contribute to a violation of state or national air quality standards or cause an adverse impact to visibility in any federal Class I area. The PSD program is generally designed to provide a more comprehensive source impact analysis than the NSR program, including effect on air quality related values, e.g., visibility, that have been identified for Class I areas. NSR/PSD and the use of air monitoring data in source impact analyses to identify existing (representative) conditions and potential future impacts are addressed at the following Internet addresses:

-- http://www.epa.gov/nsr/
-- http://www.epa.gov/ttn/amtic/files/ambient/criteria/reldocs/4-87-007.pdf
-- http://www.epa.gov/ttnamti1/files/ambient/visible/r-99-003.pdf

Q. Clean Air Act section 110(a)(2)(D) – the interstate transport provision that also addresses transport between states and tribes.

Section 110(a)(2)(D) is the provision of the Clean Air Act that requires EPA to ensure that each state's SIP prevents emissions from that state contributing significantly to nonattainment in another state. So far, EPA has used this section twice to require states to control their emissions because of effects on nonattainment in other states, in the NOx SIP Call rule and the Clean Air Interstate Rule. A section of the Clean Air Interstate Rule preamble discussed the tribal issues of that particular action.

Tribes can be treated as if they were states under this provision, both as upwind contributors and as downwind receptors of air pollution, but as of the date of this document no such tribe has actually been officially treated in this way. In concept, this section can apply between a tribe and the state within which it is located, not just other states. A downwind tribe would need to be experiencing nonattainment with a NAAQS for this provision to be used to seek emission reductions from the upwind state or states; to date, only monitoring data has been used as evidence of such nonattainment in the two cases in which EPA has applied this section to states. The details of Section 110 and applications in national rules are available at the following Internet address:

-- http://www.epa.gov/oar/caa/caa110.txt
-- http://www.epa.gov/ttn/naaqs/ozone/rto/rto.html
-- http://www.epa.gov/CAIR/index.html

R. The GAP program

Under its Indian Policy, Presidential Memorandum and Executive Orders, EPA works with Tribal governments on a government-to-government basis and recognizes Tribes as the primary parties for making environmental policy decisions and carrying out program responsibilities affecting Indian reservations, their environments, and the health and welfare of the reservation populace. One tool that EPA has to assist Tribes in developing Tribal environmental protection programs is the General Assistance Program (GAP).

"Guidelines on the Award and Management of General Assistance Agreements for Indian Tribes" provide the national policy guidelines and criteria for the award and administration of GAP grants. They reflect statutory and regulatory requirements and, in some instances, establish new binding requirements that have not been announced previously. The EPA Regions may provide supplemental guidelines and establish Regional priorities and criteria that are consistent with relevant statutes, regulations and this document. The complete document is available at the following Internet address:

-- http://www.epa.gov/indian/pdfs/gap2000.pdf

S. Visibility provisions of the Clean Air Act, mandatory and non-mandatory Class I areas

Section 162 of the Clean Air Act designates international parks, national wilderness areas, national memorial parks, and national parks greater than a certain size to be Class I areas. Sections 169A and 169B declare as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in such areas where impairment results from manmade air pollution. A study and report to Congress on available methods for implementing this national goal is authorized and is to be accompanied by recommendations for monitoring, modeling and preventing/remedying manmade pollution and resulting visibility impairment. Regulations are to be promulgated to assure reasonable progress toward meeting the national goal and compliance with the requirements of these sections. An assessment and evaluation that identifies, to the extent possible, sources and source regions of visibility impairment including natural sources as well as source regions of clear air for class I areas is to be made within 3 years after enactment of the Clean Air Act Amendments of 1990. Establishment of Visibility Transport Regions and Commissions is authorized for assessing the scientific and technical data, pertaining to adverse impacts on visibility from potential or projected growth in emissions from sources located in the Visibility Transport Region and recommend measures that should be taken under the Clean Air Act to remedy such adverse impacts. Relevant sections of the CAA, reports on visibility, and information on the regional haze program and on Regional Planning Organizations can be found at the following Internet addresses:

-- http://www.epa.gov/air/caa/caa162.txt
-- http://www.epa.gov/air/caa/caa169A.txt
-- http://www.epa.gov/air/caa/caa169B.txt
-- http://www.epa.gov/air/visibility/index.html

IV. Tribal Air Quality Issues, Relevant Air Monitoring Air Monitoring and Tribal Air Monitoring Activities

This section will examine the reasons for tribal air quality monitoring and provide examples of current tribal air monitoring.

Section 301 (d) of the 1990 Clean Air Act Amendments provides federally recognized tribal governments the authority to implement Clean Air Act programs for their reservations and other land that they can demonstrate jurisdiction. The Tribal Authority Rule (TAR) promulgated on February 12, 1998, further delineates the authority of tribes to implement air quality programs under the Act.

Tribes may need to conduct ambient air monitoring for a variety of reasons which include the following: (1) attainment with health and welfare based National Ambient Air Quality Standards (NAAQS); (2) impairment of visibility and biological diversity for vistas within or near reservations; (3) measurement of toxic air pollutants for health and ecological effects; (4) collection of near-real time data for reporting Air Quality Index (AQI) to the tribal community and to EPA's AIRNOW real-time mapping program, (5) monitoring air quality related to tribal environmental and cultural resource concerns, (6) being part of a Regional/State monitoring network (7) for determining air quality background levels and establishing air quality baselines and (8) to increase awareness that indoor environments play a large, if not the largest, role in causing the increase in asthma and respiratory disease.

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Tribes have a need to understand the short and long term effects of long distance transport on tribal lands and the effects of atmospheric deposition on the ecology of their lands. Tribes also need air monitoring data to identify the role of off-reservation sources and /or to build a case or partnership for controlling those sources. Examples of these programs include long term IMPROVE, NADP, MDN, ozone, PM2.5, precursor gas and toxic air quality monitoring.

The following is a review with examples of how the tribes have conducted air quality monitoring to provide data: (see appendix?? for more detailed examples of specific air monitoring)

1. Air monitoring for compliance with health based NAAQSs

Tribes are currently monitoring to demonstrate compliance with national standards, primarily for ozone and particulate matter, in areas of the country that are not in compliance with the NAAQSs for these pollutants. The data from these sites may be used to demonstrate the need to develop a tribal implementation plan, to show the inadequacies of state or federal implementation plans (or monitoring networks) or to warn tribal members of unhealthy air quality. Tribes may also be well located to perform air monitoring that broadens the coverage of state SIP monitoring networks. For example, several tribes in Regions 1 operate

ozone and PM2.5 air monitoring sites in areas that the states are unable to monitor, such as the island of Martha's Vineyard, MA or far eastern ME.

An example of this type of air monitoring is the ozone air quality monitoring being performed is the Wampanoag Tribe of Gay Head at Aquinnah, MA (Martha's Vineyard). The tribe is currently operating an air monitoring program consisting of an ozone monitor, an IMPROVE sampler, and a meteorological station. The station is located in the Massachusetts non-attainment area in an area where there is no state air monitoring. In 2005 the station recorded four days above the 8-hr. ozone NAAQS and provided the tribe with health related air quality data to inform tribal members. Data from this station will also provide the tribe with the ability to ensure that ozone air quality standards will be met in the future.

PM10 monitoring has been on-going in non-attainment areas on Tribal lands in Montana for many years. The Confederated Salish and Kootenai Tribes and the Northern Cheyenne Tribes were designated non-attainment for PM10 in 1989. Ongoing monitoring for PM10 will be required to satisfy compliance with their respective Tribal Implementation Plans. PM2.5 monitoring was also initiated in these two areas as a screening tool to ensure compliance with the PM2.5 standard.

2. Impairment of visibility for vistas within or near reservations

Visibility measurements are another important measurement objective for tribal reservations designated as Federal mandatory Class 1 areas. The CAA amendments of 1990 set a target of improving visibility in mandatory Class 1 Areas to natural visibility conditions by 2064. Data from these sites will provide tribes important information to determine the impacts from regional haze on visual impairment on tribal lands. Examples of visibility measurements on tribal lands include the operation of IMPROVE monitors by a number of tribes and the operation of haze-cameras on tribal lands. The Aroostook Band of Micmac Indians operate both an IMPROVE monitor and a haze camera at their air monitoring site in Presque Isle Maine. Data from this site is included in the National IMPROVE web page and the haze camera is included as part of the NESCAUM haze-cam network. The Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation in northern Montana also operate an IMPROVE monitor which they use to monitor the status of their voluntary Class 1 air shed. They, the Confederated Salish and Kootenai Tribes, and the Northern Cheyenne Tribes operate IMPROVE samplers that supplement the core IMPROVE network and provide valuable information on areas that would otherwise lack monitoring resolution.

3. Toxic air pollutants for health and ecological effects

Tribes are also monitoring for hazardous air pollutants and/or air toxics. Air monitoring for these pollutants can either be for short term exposures when there is a chemical release or for long term community and ecological impacts. Sources of these pollutants include nearby stationary sources, area sources, mobile sources, and long distance transport from urban areas. Data from these sites provide the tribes critical information on hazardous pollutant exposures and impacts of air toxics on communities and tribal lands through risk analyses conducted using this monitoring data. Examples of this type of monitoring include mercury deposition monitoring or the impact of a nearby power plant or pulp mill. The Nez Perce Tribe of Idaho is currently conducting air toxics monitoring in the town of Lewiston and on their reservation for toxic emissions from the Potlatch pulp mill in Lewiston.

4. Monitoring to Support AQI and AIRNow

Some Tribes are operating continuous monitoring for ozone and PM2.5 and convert these data to the appropriate AQI, based on EPA's AQI concept. This AQI relates concentration of pollutants to their potential health effects and can be used to alert a community to unhealthy air quality conditions. Another critical role for tribal monitoring is being part of the national AIRNOW mapping program. These sites provide near real-time data quality information and valuable information to better understand the fate and transport of air pollution.

5. Significant air quality related environmental and cultural resource concerns

One of the most important reasons that tribes are conducting air quality monitoring is to gather information on the long term air quality effects on the tribal community and on tribal lands. In many cases tribes use their ancestral lands for subsistence hunting and fishing, traditional rites, and harvesting native plants. Tribes are concerned that long term exposures to air pollutants, acid rain, and heavy metal deposition will adversely affect these resources. It should be noted that this type of air monitoring requires a long term commitment both in term of funding and in resources (for operation of equipment and analyses/assessments of the data). Examples of this type of monitoring include operating trace level SO2, CO and NOy monitors, sulfate, nitrate, metals, and NADP & MDN samplers and IMPROVE samplers.

6. Regional Monitoring

Another critical role for tribal monitoring is being part of a Regional/State monitoring network. Tribes may be well located to perform air monitoring that broadens the coverage of state SIP monitoring networks and supports the national AIRNOW mapping program. Several tribes in Regions 1 operate ozone and PM2.5 air monitoring sites in areas that the states are unable to monitor, such as

the island of Martha's Vineyard, MA or far eastern ME. Not only do these sites provide extended coverage for the regional air monitoring program, but also they provide improved coverage for EPA's AIRNOW real-time air quality mapping program. These sites provide valuable information to better understand the fate and transport of air pollution.

7. Determining Air Quality Background Levels and Establishing Air Quality Baselines for PSD

In some cases tribes will need to conduct air quality monitoring to determine air quality background levels or to establish a baseline. This information is important for the protection of areas with pristine air quality and to provide quantitative data before new stationary sources are located in or near Indian Country.

8. Indoor Air Quality

The increase in asthma and respiratory disease, and the attempt to discover their causes has led to an increased awareness that indoor environments play a large, if not the largest, role in causing this issue. Molds, tobacco smoke, Radon, improper ventilation, insect infestations, and cooking/heating fires all play a role in increasing the effects of respiratory distress on effected populations and to a disproportionate extent, Tribal members. Funding for monitoring projects such as the Radon monitoring program, Tools for Schools, and others, can be used to assist in identifying problems and suggest solutions. This information can be used to act or can influence other mechanisms to assist in remediation of Indoor Air Quality issues.

9. Source Monitoring

Tribes may need to conduct emission monitoring on their major point sources for compliance purposes. This may be in the form of stack tests or by conducting continuous emission monitoring. Normally tribes monitors for particulate, sulfur dioxide, nitrogen oxides, volatile organic compounds and/or carbon monoxide. Generally this monitoring is required by a PSD or operating permit.

V. Implementation of Monitoring

There is a growing movement in the United States of Tribal organizations taking an increased interest in ambient air quality issues on Tribal lands.

Tribes wishing to examine ambient air quality issues on their reservations or tribal lands should have a good working strategy in place as they decide what their interests and concerns are in the development of their work plan and program strategy. Tribal entities often decide that the best way to assess the current air quality situation is through the use of ambient air quality monitors. A strategic approach to monitoring should incorporate specific planning stages.

Initially, a tribe will need to work with their EPA regional contacts to begin development of a work plan which will be required for EPA operational grant funds and used to organize the direction of the program. This is especially important in the planning phase as many of the air monitoring development steps can be incorporated into the work plan objectives and thus funded by EPA. This also obligates EPA to provide guidance and technical assistance throughout the whole process.

The tribe should then research a complete list of sources on local, regional and even national levels depending on the pollutant of interest and type of monitoring incorporated. A tribe can identify which pollutants are of the greatest concern through existing methods and tools such as:

- EPA Air Quality System (AQS): A national database that tracks air monitoring data from state, local, and other entities
- Data from existing programs such as IMPROVE, CASTNET, etc.
- State Emission inventories
- Private industry monitoring data
- Climatology data

In correlation with the data, the type and need of monitoring should also focus on the category of source. The category of source will determine a great deal of what method of monitoring should be utilized and if it is worth pursuing. Categories can be broken down as follows:

- Stationary
    - Fixed facilities such as:
    - Factories
    - Power Plants
    - Chemical Process Industries
    - Petroleum Refineries

- Area
    - Dry Cleaners
    - Bakeries

    - Surface Coating Operations
    - Home Furnaces
    - Crop Burning

- Mobile
    - On-Road
        - Trucks
        - Buses
        - Cars
    - Off-Road
        - Farm vehicles
        - Construction Equipment
        - Trains

A tribe should take all of this information in to account before deciding to start sampling. Many tribes often perform their own emission inventory prior to designing a sampling program which can be incorporated into the EPA grant work plan. Two important questions should be asked and answered by the tribe about air monitoring before it begins:

1) Why are we sampling?
2) What is our response or plan if our sampling data indicates unhealthy conditions?

Once the pollutant parameter has been identified the sampling methodology should be decided on. The final decision on what type of monitors to used will also focus on many factors such as cost, accuracy, level of quality assurance, weather conditions, and conditions at monitoring site (electricity and phone line availability). Ambient air monitors can be broken down in following two general groups, manual and continuous:

- Manual Samplers
    - Time averaged data
    - Sampling Media
        - Filter samples
        - Cartridges
        - Canisters
    - Analyzed in separate step

- Continuous Samplers
    - Instrumental methods
    - On-line data

The type of air monitoring sampler to be used should weigh heavily on the monitoring objectives the tribe has developed concentrating on what they want the data to provide. Such reasons might be:

- To determine highest concentrations expected to occur in the area covered by a monitoring network
- To determine representative concentrations in areas of high population density
- To determine impact on ambient pollution levels of significant source categories
- To determine background concentration levels

This step is a difficult and important one. For example, many tribes are involved in particulate sampling. They may choose to deploy a couple manual PM2.5 samplers to an area of their tribal land. This will require a daily operator (or whenver the sampler runs) to collect the filters to process. This monitor will require electricity. The tribe may choose a continuous PM2.5 monitor, this will involve using a data logger to record readings and can be downloaded from a modem to a remote site if phone connections are available. The tribe may want to become vested in existing national programs for particulate, such as the IMPROVE and CASTNET, which offer assistance in all areas of operation, or the tribe may choose to use mini-volume samplers which are more portable and can be used in a mobile status.

An air monitoring site should be chosen based on what information the tribe wishes to capture. Monitoring can be performed to capture emissions from a specific source, for background information, or to gather information on concentrations found near schools and neighborhoods. Some Reservations are large enough that monitors are needed in multiple locations.

Once a tribe has identified pollutants of concern and a potential site(s), grant money must be obtained. A work plan is drafted explaining the need for a monitor and submitted to the Regional EPA office. Cost information must be collected, both for the monitor and for ancillary costs. Ancillary costs vary widely with the type of monitor needed and where it is to be located. These may cover: construction of a monitoring shed or purchase of a monitoring trailer; installation of electricity and phone service; purchase of a data logger and chart recorder; lab costs; purchase of calibration devices; spare parts for monitor; tools for working on the monitor; and shipping costs to the lab. Some monitors are very complex and must be shipped back to the vendor for servicing, these costs should be considered. For a complex monitor, vendors often offer to come out and place the monitor themselves and give a training session, these costs must also be considered. A dedicated computer or laptop may be purchased for gathering data, analyzing it, and uploading it to national databases.

A tribe must also consider how audits are to be performed. These services must be performed by an outside party using separate equipment and may be contracted out. Costs for these services may be large. A tribe may even consider contracting out the entire operation of a monitor, although these costs may be prohibitive.

Once a work plan has been approved and grant money is in hand, the tribe must order the monitor and ancillary equipment and arrange for its placement. All this activity must be coordinated, along with laboratory analysis. Tribes must also learn how to use the monitor and write a quality assurance project plan (QAPP) and Standard Operating

Procedures for its operation. This can be a months-long process. Once the tribe has finished the QAPP, it is submitted to the Regional Office for approval. Although QAPPs are supposed to be written and approved before a tribe actually starts collecting data, this may be unrealistic. It is hard to write a QAPP for a monitor one has never seen, let alone operated. Although QAPPs may be copied from another tribal or state agency's QAPP, the operation of the monitor still needs to be understood by the tribal operators. ITEP courses are available for some types of monitors but not for all, and courses are offered infrequently. Tribes are also strongly encouraged to collect meteorological data at the monitoring site. This involves pricing, ordering, installing and operating additional pieces of equipment.

After data is collected, tribes need to be able to understand what to do with it. ITEP offers Data Analysis courses where tribes can learn basic statistical techniques used for demonstrating compliance with National Ambient Air Quality Standards. Data also needs to be uploaded to the EPA's AQS database. Some tribes put their data on a website so tribal members can access it on a day-to-day basis.

All of the above considerations need to be addressed if a tribe is to have a successful monitoring program.

VI. The Role of Tribal Monitoring In the National Monitoring Strategy

[This section will explain the history, status, and content of the National Ambient Air Monitoring Strategy and the relationship between it and tribal monitoring programs.]

(to be completed)

VII. Understanding Monitoring Data and Its Implications

1. Background

There are many approaches to data interpretation ranging from a simple data summary to complex statistical procedures. The range of possibilities can be overwhelming, but is easily narrowed by asking a simple question: "Why was monitoring conducted in the first place?" The appropriate use of monitoring data is intimately linked with the monitoring objective. Assuming that the monitoring agency has followed the procedures outlined in Section ??, the existing or proposed monitoring plan has a purpose in mind and steps have been taken to ensure that the final data product is adequate for its intended purpose.

For example, an agency located in a potential high ozone area may set up an ozone monitor to gauge attainment of the National Ambient Air Quality Standard (NAAQS). Quality assurance measures must be put in place to collect reliable data for a 3-year period. If the dataset is found to meet data quality objectives then it may be used as the basis for NAAQS attainment designation for the county. If the data are incomplete or otherwise compromised, then an attainment determination will not be possible.

Similarly, there are data quality requirements for hazardous air pollutant (HAP) monitoring which is intended for use in exposure assessment and health risk interpretation. It is not uncommon for an agency to collect ambient HAP data only to discover later that the wrong target compounds were reported or that detection limits were too high to allow comparing the data against cancer risk benchmarks. These problems can be minimized by effective planning which identifies the intended use of monitoring data and delineates specific monitoring quality objectives.

2. Purpose

The main goal of this section is to help Tribal staff achieve their monitoring program objectives through an effective use of monitoring data. We will give an overview of potential data uses and provide links to relevant guidance documents and examples. Possible data uses include: determining attainment of NAAQS for criteria pollutants; characterizing population exposure to HAPs, also known as "air toxics"; assessing air pollutant trends over time; and attributing source contribution to air pollution.

Basic data summary and statistical techniques allow the monitoring agency to effectively communicate project results. These methods are important for a variety of purposes: to inform Tribal members and others about local air quality; to summarize monitoring results in grant documentation and the final project report; and to describe prior air quality findings as justification for new or renewed funding in a grant application.

This section will be useful to an agency that has already collected a dataset and needs help understanding it. However it may be even more valuable to a program manager who is in the stages of planning an air quality study as it will provide a clear understanding of what an ambient monitoring program can do for them and what questions it can answer.

3. Recommendations for specific data uses

3.1 Criteria pollutants

Tribal agencies that conduct ambient air quality monitoring most frequently collect data for the six common pollutants (also referred to as "criteria" pollutants): carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_x), ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2). PM falls into two categories: particles smaller than 10 microns in diameter (PM_{10}) and particles smaller than 2.5 microns ($PM_{2.5}$). This section will describe how criteria pollutant monitoring data may be interpreted and used as part of an air quality management program.

For more information on sources of criteria pollutants, health and environmental effects, efforts underway to help reduce the pollutant, and other helpful resources, visit: www.epa.gov/air/urbanair/6poll.html

3.1.1 NAAQS attainment

EPA has set NAAQS standards for the six criteria pollutants. The NAAQS include both primary and secondary standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. The table below lists the current NAAQS for criteria pollutants. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu g/m^3$).

Table 1. National Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[1]	None
	35 ppm (40 mg/m^3)	1-hour[1]	None
Lead	1.5 $\mu g/m^3$	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 $\mu g/m^3$)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM_{10})	50 $\mu g/m^3$	Annual[2] (Arith. Mean)	Same as Primary
	150 ug/m^3	24-hour[1]	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual[3] (Arith. Mean)	Same as Primary
	65 ug/m^3	24-hour[4]	
Ozone	0.08 ppm	8-hour[5]	Same as Primary
Sulfur Oxides	0.03 ppm	Annual (Arith. Mean)	-------

	0.14 ppm	24-hour[1]	-------
	-------	3-hour[1]	0.5 ppm (1300 ug/m^3)

[1] Not to be exceeded more than once per year.
[2] To attain this standard, the 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.
[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.
[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.
[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

"Designation" is the term EPA use to describe the air quality in a given area for any of the criteria pollutants. Geographic areas are designated as "attainment" or "nonattainment" based on ambient air monitoring data collected in that area and reported to the Air Quality System (AQS) national database. Tribes and States submit recommendations to the EPA as to whether or not an area is attaining the NAAQS for a criteria pollutant. After working with the Tribal or State agencies and considering the air quality data, EPA officially designates an area as attainment or nonattainment. If an area is designated as nonattainment EPA informs the public that the air in the area is unhealthy to breathe, and states, local and tribal governments must develop and implement control plans to reduce pollution. A Tribal Implementation Plan (TIP) is a set of regulatory programs that a tribe can develop and adopt to help attain or maintain national air quality standards. Once a nonattainment area meets the standards and additional redesignation requirements in the CAA [Section 107(d)(3)(E)], EPA will designate the area to attainment as a "maintenance area."

The website listed below provides an unofficial list of Tribes in 8-hour ozone nonattainment areas as of April 15, 2004. Official nonattainment boundaries are specified in 40 CFR Part 81.
www.epa.gov/ozonedesignations/tribaldesig.htm

Detailed instructions on how to determine attainment status based on ambient monitoring data may be found in the Code of Federal Regulations (CFR) Title 40 Part 50. The relevant passages for each criteria pollutant is included as Attachment 1 and may also be accessed on the web at:
http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=e18bc4907fc6d399c035b0bd125e238b&tpl=/ecfrbrowse/Title40/40cfr50_main_02.tpl

3.1.2 Understanding the Air Quality Index (AQI) and AIRNow

The AQI is an index for reporting daily air quality. It tells how clean or polluted the air is, and what associated health effects might be a concern for the public. The AQI focuses on health effects that may be experienced within a few hours or days after breathing polluted air. EPA calculates the AQI for five of the criteria pollutants: O_3, PM, CO, SO_2, and NO_x. The AQI scale runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy-at first for certain sensitive groups of people, then for everyone as AQI values get higher.

Raw ambient air monitoring data is converted into AQI values using standard formulas developed by EPA. An AQI value is calculated for each pollutant in an area. The highest AQI value for the individual pollutants is the AQI value for that day. For example, if a certain date had AQI values of 90 for ozone and 88 for sulfur dioxide, the AQI value would be 90 for the pollutant ozone on that day.

The purpose of the AQI is to help the public understand what local air quality means to their health. To make it easier to understand, the AQI is divided into six categories, each of which corresponds to a different level of health concern. The six levels of health concern and what they mean are:

- **"Good"** The AQI value for your community is between 0 and 50. Air quality is considered satisfactory, and air pollution poses little or no risk.
- **"Moderate"** The AQI for your community is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- **"Unhealthy for Sensitive Groups"** When AQI values are between 101 and 150, members of sensitive groups may experience health effects. This means they are likely to be affected at lower levels than the general public. For example, people with lung disease are at greater risk from exposure to ozone, while people with either lung disease or heart disease are at greater risk from exposure to particle pollution. The general public is not likely to be affected when the AQI is in this range.
- **"Unhealthy"** Everyone may begin to experience health effects when AQI values are between 151 and 200. Members of sensitive groups may experience more serious health effects.
- **"Very Unhealthy"** AQI values between 201 and 300 trigger a health alert, meaning everyone may experience more serious health effects.
- **"Hazardous"** AQI values over 300 trigger health warnings of emergency conditions. The entire population is more likely to be affected.

The AIRNow Web site delivers daily AQI forecasts as well as real-time AQI conditions for over 300 cities across the United States. The EPA developed the AIRNow program together with the National Oceanic and Atmospheric Administration (NOAA), National Park Service (NPS), Tribal, State, and Local agencies to provide the public with easy access to national air quality information. AQI data are presented in maps which were generated based on "real-time" ambient monitoring data using either federal reference or equivalent monitoring techniques or techniques approved by the state, local or tribal monitoring agencies. Although some preliminary data quality assessments are performed, the data as such are not fully verified and validated through the quality assurance procedures monitoring organizations use to officially submit and certify data in AQS. Therefore, data are used on the AIRNow Web site only for the purpose of reporting the AQI. Information on the AIRNow web site is not used to formulate or support regulation, guidance or any other Agency decision or position.

In 2005 there were 13 Tribal monitoring agencies that participated in AIRNow. Tribes interested in joining the AIRNow network should contact Richard Wayland (OAQPS) at 919-541-4603 or email: wayland.richard@epa.gov.

Air quality forecasts and more information about AQI and AIRNow is available at: www.airnow.gov

3.1.3 Putting data into context

In addition to determining NAAQS attainment and AQI values, Tribal monitoring agencies may benefit from putting their monitoring data into a broader context. There are a few ways to do this. The Tribe may look up data for the same pollutant at other monitoring sites located in the same State or region to see how the values compare. It may also be helpful to look at a nation-wide summary of data or a list of nonattainment areas. A broader context may also be obtained by learning about national trends in air quality data.

EPA's AirData website provides access to air pollution data for the entire US. AirData produces reports and maps of air pollution data based on user-specified queries. For example a Tribal agency located in Arizona may wish to look up last year's ozone data for all monitoring sites in the State. The link below is the interface where the user selects the geographic area for the data search. Subsequent web pages narrow the search to the desired pollutant, year, and report format.
http://www.epa.gov/air/data/geosel.html

EPA's "Green Book" lists all nonattainment areas in the US. The user can access a variety of maps and reports for each criteria pollutant at this web site:
http://www.epa.gov/air/oaqps/greenbk/

EPA tracks air pollution trends using two main indicators: ambient air monitoring data and pollutant emissions. EPA estimates nationwide emissions of criteria pollutants and air toxics based on many factors, including actual measurements, levels of industrial activity, fuel consumption, vehicles miles traveled, and other estimates of activities that cause pollution. For EPA's most recent evaluation of air pollution trends, click on the following:
http://www.epa.gov/airtrends/

3.2 Air quality characterization for ambient, deposition, and visibility data

The previous section was focused specifically on criteria pollutants and interpreting data in terms of the NAAQS rules. Beyond the six criteria pollutants, however, there are hundreds of other pollutants and indices that a monitoring agency may wish to address. These non-criteria pollutants and measures include ambient air toxics, wet/dry deposition, visibility data, and even biomonitoring of ozone injury to sensitive plants. These types of data do not have corresponding national air quality standards that help to guide data summary and interpretation. Instead, monitoring results should be described using basic summary statistics. The data may also be visualized using simple graphic techniques.

3.2.1 Basic summary statistics

The first step in summarizing air quality data is to take inventory of the number of samples collected, the range of measurements, and to provide related information about the monitoring schedule. It is important to specify the measurement units of the pollutant. If any of the samples are below detection limits then it becomes necessary to state the minimum detection limit (MDL) and the number of samples below the MDL. An example in table form is shown below.

Table 2. Example of monitoring data summary

Pollutant	**Sampling schedule**	**Sampling period**	**Total samples**	**Unit**	**MDL**	**Min. value**	**Max. value**	**Number samples <MDL**
Benzene	1-in-6 days	Jan. 2003 – Dec. 2004	107	ppbC	0.01	0.02	1.3	0
1,3-butadiene	1-in-6 days	Jan. 2003 – Dec. 2004	107	ppbC	0.01	Below MDL	0.8	84
Arsenic (PM_{10})	Monthly	Jan. 2003 – June. 2004	18	ug/m^3	0.002	Below MDL	0.012	10
Cadmium (PM_{10})	Monthly	Jan. 2003 – June. 2004	18	ug/m^3	0.01	Below MDL	0.02	4
Lead (PM_{10})	Monthly	Jan. 2003 – June. 2004	18	ug/m^3	0.005	0.008	0.31	0

The next step is to summarize some basic characteristics of the data set using common statistical measures. Some useful examples include: measures of central tendency, such as the mean or median; measures of relative standing, such as percentiles; measures of dispersion, such as range, variance, standard deviation, coefficient of variation, or interquartile range; measures of distribution symmetry or shape; and measures of association between two or more variables, such as correlation. These measures can then be used for description and communication about the dataset.

The definitions and procedures outlined in parts 3.2.1 and 3.2.2. are primarily taken from the EPA document "Guidance for Data Quality Assessment – Practical Methods for Data Analysis" (EPA/600/R-96/084) which is available in full at this website:
http://www.epa.gov/quality/qs-docs/g9-final.pdf

This section provides mathematical formulas that allow the user to calculate descriptive statistics using a simple calculator. These procedures can be carried out more easily by using the formula functions in any computer spreadsheet program. Data analysts that are interested in continuing on to do advanced statistical procedures may consider investing in a statistical software package and attending training sessions to practice using them. The end of this section provides resources for those interested in learning more.

Central tendency

The most common estimates for central tendency in environmental data are the mean and median. The ***mean*** may be considered to be the "center of gravity" of the dataset. It is calculated as a basic arithmetic average. The ***median*** is the value which falls directly in the middle of the data when the measurements are ranked in order from smallest to largest. Thus ½ of the data are smaller than the sample median and ½ of the data are larger than the sample median. Unlike the mean, the median is not influenced by a small number of extreme values.

Formulas for measuring central tendency:

Let $X_1, X_2, \ldots, X_n$ represent the n data points.

Sample Mean: The sample mean $\bar{x}$ is the sum of all the data points divided by the total number of data points (n):

$$\bar{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$$

Sample Median: The sample median ($\tilde{X}$) is the center of the data when the measurements are ranked in order from smallest to largest. To compute the sample median, list the data from smallest to largest and label these points $X_{(1)}, X_{(2)}, \ldots, X_{(n)}$ (so that $X_{(1)}$ is the smallest, $X_{(2)}$ is the second smallest, and $X_{(n)}$ is the largest).

If the number of data points is odd, then $\tilde{X} = X_{([n+1]/2)}$

If the number of data points is even, then $\tilde{X} = \frac{X_{(n/2)} + X_{([n/2]+1)}}{2}$

Relative Standing (Percentiles)

It may be useful to know the relative position of one or several observations in relation to all of the observations. Percentiles are one such measure of relative standing that may also be useful for summarizing data. A percentile is the data value that is greater than or equal to a given percentage of the data values. For example the data point which is the 25th percentile is greater than or equal to 25% of the data values and is less than or equal to 75%. Important percentiles usually reviewed are the quartiles of the data: the 25th, 50th, and 75th percentiles. The 50th percentile is also called the sample median (previously described), and the 25th and 75th percentiles are used to estimate the dispersion of a data set (next section).

Formula for calculating percentiles with example:

Let $X_1, X_2, \ldots, X_n$ represent the n data points. To compute the p^{th} percentile, y(p), first list the data from smallest to largest and label these points $X_{(1)}, X_{(2)}, \ldots, X_{(n)}$ (so that $X_{(1)}$ is the smallest, $X_{(2)}$ is the second smallest, and $X_{(n)}$ is the largest). Let t = p/100, and multiply the sample size n by t. Divide the result into the integer part and the fractional part, i.e., let nt = j + g where j is the integer part and g is the fraction part. Then the p^{th} percentile, y(p), is calculated by:

If g = 0, $y(p) = (X_{(j)} + X_{(j+1)})/2$

otherwise, $y(p) = X_{(j+1)}$

Example: The 90th and 95th percentile will be computed for the following 10 data points (ordered from smallest to largest) : 4, 4, 4, 5, 5, 6, 7, 7, 8, and 10 ppb.

For the 95th percentile, t = p/100 = 95/100= .95 and nt = (10)(.95) = 9.5 = 9 + .5. Therefore, j = 9 and g = .5. Because g = .5 ≠ 0, $y(95) = X_{(j+1)} = X_{(9+1)} = X_{(10)}$ = 10 ppm. Therefore, 10 ppm is the 95th percentile of the above data.

Measures of Dispersion

Measures of central tendency are more meaningful if accompanied by information on how the data spread out from the center. Measures of dispersion in a data set include the range, variance, sample standard deviation, coefficient of variation, and the interquartile range. These measures are all described below and formulas provided.

The easiest measure of dispersion to compute is the sample ***range***. For small samples, the range is easy to interpret and may adequately represent the dispersion of the data. For large samples,

the range is not very informative because it only considers (and therefore is greatly influenced) by extreme values.

The sample ***variance*** measures the dispersion from the mean of a data set. A large sample variance implies that there is a large spread among the data so that the data are not clustered around the mean. A small sample variance implies that there is little spread among the data so that most of the data are near the mean. The sample variance is affected by extreme values and by a large number of nondetects. The sample standard deviation is the square root of the sample variance and has the same unit of measure as the data.

The ***coefficient of variation (CV)*** is a unitless measure that allows the comparison of dispersion across several sets of data. The CV is often used in environmental applications because variability (expressed as a standard deviation) is often proportional to the mean.

When extreme values are present, the ***interquartile range*** may be more representative of the dispersion of the data than the standard deviation. This statistical quantity does not depend on extreme values and is therefore useful when the data include a large number of nondetects.

Formulas for calculating measures of dispersion:

Let $X_1, X_2, ..., X_n$ represent the n data points.

Sample Range: The sample range (R) is the difference between the largest value and the smallest value of the sample, i.e., R = maximum - minimum.

Sample Variance: To compute the sample variance (s^2), compute:

$$s^2 = \frac{\sum_{i=1}^{n} X_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} X_i\right)^2}{n-1}$$

Sample Standard Deviation: The sample standard deviation (s) is the square root of the sample variance, i.e.,

$$s = \sqrt{s^2}$$

Coefficient of Variation: The coefficient of variation (CV) is the standard deviation divided by the sample mean (Section 2.2.2), i.e., $CV = s/\bar{X}$. The CV is often expressed as a percentage.

Interquartile Range: Use the directions in Section 2.2.1 to compute the 25th and 75th percentiles of the data (y(25) and y(75) respectively). The interquartile range (IQR) is the difference between these values, i.e.,
IQR = y(75) - y(25).

3.2.2 Trends analysis

To be written

3.2.3 Data visualization

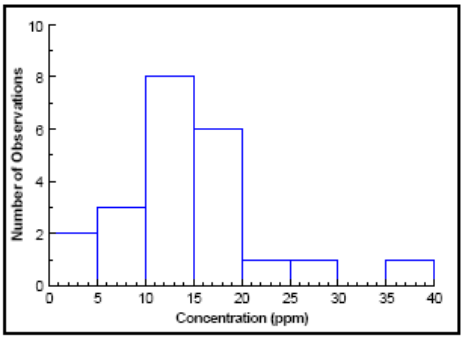
Simple graphing techniques are useful to describe the dataset and communicate monitoring results. Graphs can be used to identify patterns and trends in the data. Graphical representations include displays of individual data points, statistical quantities, temporal data, spatial data, and two or more variables.

Detailed instructions on how to produce these graphics are provided in Section 2 of the previously mentioned "Guidance for Data Quality Assessment – Practical Methods for Data Analysis", available at: http://www.epa.gov/quality/qs-docs/g9-final.pdf

Histogram/Frequency Plots

Two of the oldest methods for summarizing data distributions are the frequency plot and the histogram. Both the histogram and the frequency plot use the same basic principles to display the data: dividing the data range into units, counting the number of points within the units, and displaying the data as the height or area within a bar graph.

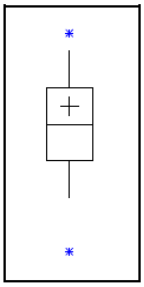
Figure 1. Example of a frequency plot



Box and Whisker Plot

A box and whisker plot or box plot is a schematic diagram useful for visualizing important statistical quantities of the data. A box and whiskers plot is composed of a central box divided by a line and two lines extending out from the box called whiskers. The length of the central box indicates the spread of the bulk of the data (the central 50%) while the length of the whiskers show how stretched the tails of the distribution are. The sample median is displayed as a line through the box and the sample mean is displayed using a '+' sign. Any unusually small or large data points are displayed by a '*' on the plot.

Figure 2. Example of a box and whisker plot

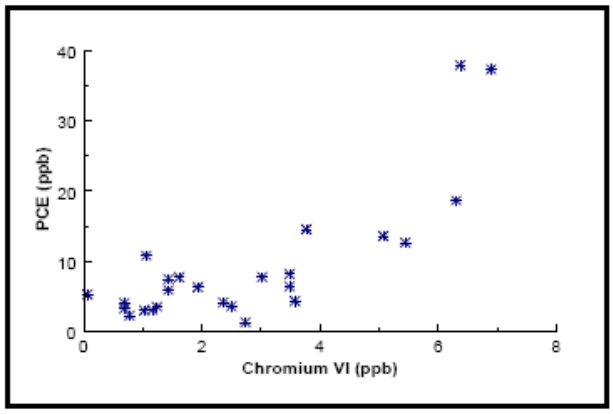


Scatter Plot

For data sets consisting of paired observations where two or more variables are measured for each sampling point, a scatter plot is one of the most powerful tools for analyzing the relationship between two or more variables. A scatter plot clearly shows the relationship between two variables. Both potential outliers from a single variable and potential outliers from the paired variables may be identified on this plot. A scatter plot also displays the correlation between the

two variables. Scatter plots of highly linearly correlated variables cluster compactly around a straight line.

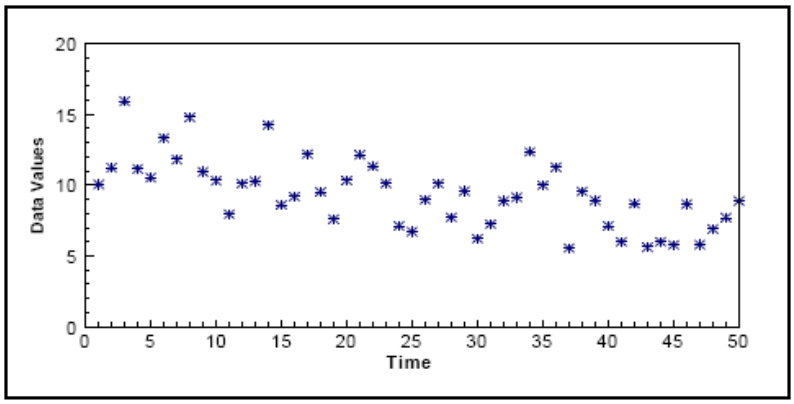
Figure 3. Example of a scatter plot



Time Plot

One of the simplest plots to generate that provides a large amount of information is a time plot. A time plot is a plot of the data over time. This plot makes it easy to identify large-scale and small-scale trends over time. Small-scale trends show up on a time plot as fluctuations in smaller time periods. For example, ozone levels over the course of one day typically rise until the afternoon, then decrease, and this process is repeated every day. An example of a large-scale trend is a multi-year decrease in air pollution resulting from effective air quality control programs. For example, the annual average concentration of NO_x at a particular monitoring site may decline over the course of several years as a result of emissions controls at local industries and the introduction of cleaner cars.

Figure 4. Example of a time plot



3.2.4 References, tools, and resources

There are additional resources for air monitoring staff and data analysts who would like to learn more about statistical techniques and data analysis.

EPA courses

EPA's Air Pollution Training Institute (APTI) primarily provides technical air pollution training to state, tribal, and local air pollution professionals, although others may benefit from this training. The curriculum is available in classroom, telecourse, self-instruction, and web-based formats. A few potentially useful courses are described below.

Introduction to Environmental Statistics

This series of online lectures was developed for USEPA by the University of Illinois at Chicago School of Public Health, Environmental and Occupational Health Sciences Division. No registration is required to access the archived lectures. The lectures are available at this website: http://www.epa.gov/air/oaqps/eog/envirostats/index.html

Module 1: Interpreting Your Monitoring Data
Mudule 2: Sampling and Analytical Limitations & Sample Detection Limits
Module 3: Quality Assurance Quality Control
Module 4: Analysis of Trends
Module 5: Language of Data Graphing
Module 6: Censored Values and Extreme Values
Module 7: Fundamentals of Trajectory Analysis

Introduction to Environmental Statistics - SI:473B

This course introduces the student to the basic concepts of statistical analysis. The course was designed for students with little formal education in statistics who must apply statistical techniques to analyze environmental data. The package has seven modules, a workbook, and a VHS format video tape. The workbook and video tape are mailed to the student by EPA, but it is necessary to acquire one of the recommended companion texts.

Course information is available at:

http://www.epa.gov/air/oaqps/eog/catalog/si473b.html

Major Topics

- Descriptive statistics
- Hypothesis testing
- One- and two-sample t-tests of significant differences
- Analysis of variance
- Chi-square techniques for tests of homogeneity of data sets
- Decision flow chart
- Quality control charts
- Guide to statistical problem solving

Training Courses on Quality Assurance and Quality Control Activities

EPA Quality Staff develops a variety of traditional training courses on quality assurance (QA) and quality control (QC) activities and the EPA quality system. For each course, there is a facilitator guide with slides and speaker notes, suggested activities, and supplementary materials for student handouts. Instructors should have an applied knowledge in quality system management, as well as quality assurance and quality control activities.

One subject area of particular interest is "Interpreting monitoring data". This half day course teaches participants how to deal with monitoring data using statistics. Participants learn about the need to incorporate systematic planning into monitoring activities, realize the importance of representativeness, be able to graphically view the data, and gain an insight into the complexities of statistical analyses of monitoring data. "Introduction to Data Quality Assessment" is another useful subject area. This one-day course demonstrates how to perform a data quality assessment (DQA) to evaluate data and provides detailed information on graphical and statistical tools. This course will familiarize participants with the process for performing a data quality assessment. It does not involve detailed instructions on the statistics involved in the process. The course is intended for managers or analysts that either use (analyze) data themselves or review the use of data by others. Materials are available at: http://www.epa.gov/quality/trcourse.html

Other tools and resources

EPA has a website for Quality-Related Resources which contains links to other sources of information on quality systems available on the web:
http://www.epa.gov/quality/qa_links.html

Examples of tools and resources available through the EPA quality resources page:

DataPlot - National Institutes of Science and Technology
DataPlot is a free, public-domain, multi-platform software system for scientific visualization, statistical analysis, and non-linear modeling.
www.itl.nist.gov/div898/software/dataplot.html/

StatPages.Net - John C. Pezzullo
Contains links to online calculators, free statistical software, online statistics books, tutorials, and related resources.
members.aol.com/johnp71/javastat.html

Statistics Calculators - UCLA Department of Statistics
Calculators include statistical graphs, power calculations, sample size calculations, etc.
calculators.stat.ucla.edu/

George Mason University - Guide to Statistical Software
A comparison of commercially available statistical software.
www.galaxy.gmu.edu/papers/astr1.html

3.3 Source apportionment: using tools such as emissions inventories, wind direction data, and receptor models to determine pollution sources

To be written

3.4 Exposure assessment for hazardous air pollutants

To be written

3.5 Multi-media exposure assessment using deposition monitoring

To be written

4 Conclusions

To be written

5 Attachment 1. Excerpts from CFR on NAAQS monitoring

O_3 (8-Hour)
§ 50.10 National 8-hour primary and secondary ambient air quality standards for ozone.
(a) The level of the national 8-hour primary and secondary ambient air quality standards for ozone, measured by a reference method based on appendix D to this part and designated in accordance with part 53 of this chapter, is 0.08 parts per million (ppm), daily maximum 8-hour average.

(b) The 8-hour primary and secondary ozone ambient air quality standards are met at an ambient air quality monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.08 ppm, as determined in accordance with appendix I to this part.

PM_{10}
§ 50.6 National primary and secondary ambient air quality standards for PM_{10}.
(a) The level of the national primary and secondary 24-hour ambient air quality standards for particulate matter is 150 micrograms per cubic meter (µg/m 3), 24-hour average concentration. The standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m 3 , as determined in accordance with appendix K to this part, is equal to or less than one.

(b) The level of the national primary and secondary annual standards for particulate matter is 50 micrograms per cubic meter (µg/m 3), annual arithmetic mean. The standards are attained when the expected annual arithmetic mean concentration, as determined in accordance with appendix K to this part, is less than or equal to 50 µg/m 3 .

(c) For the purpose of determining attainment of the primary and secondary standards, particulate matter shall be measured in the ambient air as PM10 (particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers) by:

(1) A reference method based on appendix J and designated in accordance with part 53 of this chapter, or

(2) An equivalent method designated in accordance with part 53 of this chapter.

$PM_{2.5}$
§ 50.7 National primary and secondary ambient air quality standards for PM2.5.

(a) The national primary and secondary ambient air quality standards for particulate matter are 15.0 micrograms per cubic meter (µg/m3) annual arithmetic mean concentration, and 65 µg/m3 24-hour average concentration measured in the ambient air as PM2.5 (particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers) by either:

(1) A reference method based on appendix L of this part and designated in accordance with part 53 of this chapter; or

(2) An equivalent method designated in accordance with part 53 of this chapter.

(b) The annual primary and secondary PM2.5 standards are met when the annual arithmetic mean concentration, as determined in accordance with appendix N of this part, is less than or equal to 15.0 micrograms per cubic meter.

> (c) The 24-hour primary and secondary PM2.5 standards are met when the 98th percentile 24-hour concentration, as determined in accordance with appendix N of this part, is less than or equal to 65 micrograms per cubic meter.

Pb

§ 50.12 National primary and secondary ambient air quality standards for lead.

> National primary and secondary ambient air quality standards for lead and its compounds, measured as elemental lead by a reference method based on appendix G to this part, or by an equivalent method, are: 1.5 micrograms per cubic meter, maximum arithmetic mean averaged over a calendar quarter.

NO_2

40 CFR § 50.11 National primary and secondary ambient air quality standards for nitrogen dioxide.

(a) The level of the national primary ambient air quality standard for nitrogen dioxide is 0.053 parts per million (100 micrograms per cubic meter), annual arithmetic mean concentration.

(b) The level of national secondary ambient air quality standard for nitrogen dioxide is 0.053 parts per million (100 micrograms per cubic meter), annual arithmetic mean concentration.

(c) The levels of the standards shall be measured by:

(1) A reference method based on appendix F and designated in accordance with part 53 of this chapter, or

(2) An equivalent method designated in accordance with part 53 of this chapter.

> (d) The standards are attained when the annual arithmetic mean concentration in a calendar year is less than or equal to 0.053 ppm, rounded to three decimal places (fractional parts equal to or greater than 0.0005 ppm must be rounded up). To demonstrate attainment, an annual mean must be based upon hourly data that are at least 75 percent complete or upon data derived from manual methods that are at least 75 percent complete for the scheduled sampling days in each calendar quarter.

SO_2

40 CFR § 50.4 National primary ambient air quality standards for sulfur oxides (sulfur dioxide).

(a) The level of the annual standard is 0.030 parts per million (ppm), not to be exceeded in a calendar year. The annual arithmetic mean shall be rounded to three decimal places (fractional parts equal to or greater than 0.0005 ppm shall be rounded up).

(b) The level of the 24-hour standard is 0.14 parts per million (ppm), not to be exceeded more than once per calendar year. The 24-hour averages shall be determined from successive nonoverlapping 24-hour blocks starting at midnight each calendar day and shall be rounded to two decimal places (fractional parts equal to or greater than 0.005 ppm shall be rounded up).

(c) Sulfur oxides shall be measured in the ambient air as sulfur dioxide by the reference method described in appendix A to this part or by an equivalent method designated in accordance with part 53 of this chapter.

(d) To demonstrate attainment, the annual arithmetic mean and the second-highest 24-hour averages must be based upon hourly data that are at least 75 percent complete in each calendar quarter. A 24-hour block average shall be considered valid if at least 75 percent of the hourly averages for the 24-hour period are available. In the event that only 18, 19, 20, 21, 22, or 23 hourly averages are available, the 24-hour block average shall be computed as the sum of the available hourly averages using 18, 19, etc. as the divisor. If fewer than 18 hourly averages are available, but the 24-hour average would exceed the level of the standard when zeros are substituted for the missing values, subject to the rounding rule of paragraph (b) of this section, then this shall be considered a valid 24-hour average. In this case, the 24-hour block average shall be computed as the sum of the available hourly averages divided by 24.

CO

40 CFR § 50.8 National primary ambient air quality standards for carbon monoxide.

(a) The national primary ambient air quality standards for carbon monoxide are:

(1) 9 parts per million (10 milligrams per cubic meter) for an 8-hour average concentration not to be exceeded more than once per year and

(2) 35 parts per million (40 milligrams per cubic meter) for a 1-hour average concentration not to be exceeded more than once per year.

(b) The levels of carbon monoxide in the ambient air shall be measured by:

(1) A reference method based on appendix C and designated in accordance with part 53 of this chapter, or

(2) An equivalent method designated in accordance with part 53 of this chapter.

(c) An 8-hour average shall be considered valid if at least 75 percent of the hourly average for the 8-hour period are available. In the event that only six (or seven) hourly averages are available, the 8-hour average shall be computed on the basis of the hours available using six (or seven) as the divisor.

(d) When summarizing data for comparision with the standards, averages shall be stated to one decimal place. Comparison of the data with the levels of the standards in parts per million shall be made in terms of integers with fractional parts of 0.5 or greater rounding up.

VIII. Storage and Access to Monitoring Data

Problem Statement

Tribes collect environmental data principally for internal use so tribal leaders can make informed decisions to accomplish their environmental policy objectives. Historically, EPA has required tribes in some Regions to submit data to the Air Quality System (AQS) as a deliverable for their Clean Air Act related grants. Not all EPA Regions have required tribal data to be submittal to AQS. Recently, there has been a push by EPA for all tribes to submit their data to AQS in all EPA Regions.

Many tribes have argued that forcing them to submit data to AQS is an infringement on their inherent tribal sovereignty. Others have argued that it isn't stated in the Tribal Authority Rule that tribal data must be submitted to a national database, and the new requirement is policy, not law. There is a link between tribal sovereignty and data collected on tribal lands, and some tribal governments are expressing significant reluctance to being forced to submit data to national databases, such as AQS. Policy relating to tribal AQS data submittal should carefully consider tribal concerns and include dialog with tribal leaders at the highest levels of government.

There is also a "right to know" aspect in U.S. public environmental policy. Both tribal and non-tribal U.S. citizens live within the tribal environmental jurisdictions as defined by the Tribal Authority Rule of the Clean Air Act, and policies developed and implemented within Indian country can also impact neighboring jurisdictions. This complicates the issue of tribal sovereignty as it relates to public access to environmental information. This is especially true for environmental data gathered through federal funding. These are also things that need to be considered.

As previously stated, several tribes currently submit their data to AQS. There are other tribes that are very open to submitting data to AQS in principal, yet the resources to accomplish the task are limited. Technical staff within tribal nations are frequently tasked with multiple duties. This sometimes requires one person to develop and utilize technical expertise in virtually every aspect of implementing the Clean Air Act within their jurisdictions. The time they can spend submitting data to AQS is limited. Since this is an infrequent task, usually only required on a quarterly basis, it can also be a difficult task to master. New resources to assist with AQS data submittal may be necessary. Presently there isn't a single person anywhere in the U.S. whose sole job is to assist tribes with AQS entry.

A. Description of AQS for Tribal Needs
(to be completed)

B. Getting data into EPA's AQS System
(to be completed)

C. What Data and When Should It Be Entered into AQS
(to be completed)

D. Who Has Access to Data Once Submitted to AQS
(to be completed)

E. How AQS Can Be Used to Retrieve Tribal Monitoring Data in Useful Forms
(to be completed)

IX. Assessment of Ambient Air Quality in Indian country in the Absence of Air Monitoring

Prior to conducting air monitoring, Tribes may want to assess air quality in Indian Country to determine if monitoring is warranted. This section will identify and briefly discuss web-based and computer models that are available to Tribes to assess air quality in Indian Country. The methods addressed in this section include:

1. Web-Based Air Quality Data Resources
2. Data Interpolation Methods
3. Local-Scale Plume Models
4. Large-Scale Grid Models
5. Smoke Models
6. High-split Model to identify sources on worst days

X.. How to Request EPA Funding and Other Support

[This section is intended to give the first steps in applying for funding and tips for things to be careful about. In the early conference calls on this document-writing project, the point was made that this section may emphasize that it is appropriate for each tribe to request the resources actually needed to accomplish its monitoring goals, to create a more complete record regarding the sufficiency of resources made available.]

(to be completed)

XI. Other Air Quality Management Program Elements

[This section is intended to give first steps and other information regarding development of emissions inventories and source reporting, adoption of source emissions standards, adoption and operation of permitting programs, etc. for the benefit of tribes that are considering or are in the early stages of involvement in such programs.]

(to be completed)

XII. The Tribal Perspective

In 2004, the Environmental Protection Agency produced a final draft document on their National Ambient Air Monitoring Strategy (NAAMS). (This document should be reviewed and commented upon by this group). The EPA says interesting and positive things about the integration of tribes in the national air monitoring strategy document. EPA had decided originally to do a separate air monitoring strategy for tribes so that tribes would not get "lost" in the national strategy. This is an important issue.

One of the motivations for tribes to want to monitor the air quality are human health issues; it is not a scientific interest in this subject. This motivation is not addressed in the NAAMS. But the NAAMS document must be examined for it has many useful details that address tribal air monitoring.

It is useful to refer to this document: the National Ambient Air Monitoring Strategy. Some important points in it are:

EPA's entire air monitoring structure has clearly moved to the Ncore strategy. This document states that there is a role for tribal participation in several Levels of this strategy. These Levels are clearly framed in this NAAMS document. And the role of tribes is clearly stated.

Ambient monitoring systems are a critical part of America's air program infrastructure. Air data from these monitoring systems are used to do several things, such as: characterize "air quality" and associated health and ecosystem impacts, to develop emission strategies to reduce adverse impacts, and to account for air quality progress over time.

The United States spends well over $200 million annually on routine ambient air monitoring programs, a figure dwarfed by the billions associated with emission reduction strategies. The ambient air data provide a basis for an accounting of an air programs progress. Therefore you can determine the value of those investments.

The Ncore strategy , mentioned in the NAAMS, talks about:

> Comprehensive monitors, (55 in rural areas) and Level 3 monitors (1,000 monitors specifically for local concerns, hotspots, etc). The 2004 EPA Draft Monitoring Strategy also states that tribes have the right to participate in this Ncore strategy. Clearly the tribes have a purpose and a right to be involved with this strategy.

In this NAAMS there is fairly clear statement of tribal needs:

> "The prevailing air monitoring issues for Tribes include a severe shortage of resources for equipment, maintenance, operations, personnel and training".

This Tribal Perspective supports the NAAMS statement of need. The tribes care about monitoring for human health reasons, not necessarily scientific reasons. And the tribes need resources for air monitoring on tribal lands.

The NAAMS highlights the fact that the Ncore strategy could benefit from including tribes because the tribes can provide additional monitoring sites, fill data gaps, and identify background conditions. These are the reasons how tribal air monitoring could help the entire strategy. Tribal monitoring can help this air quality infrastructure.

Many tribes are in isolated areas, but are subject to poor downwind air quality. The tribes want to know the air quality data, and the effects on human health. This is the reason that many tribes want their own air monitors. Human health issues are of the utmost importance to tribes (you cannot take care of "Mother Earth" without your own health being good).

The NAAMS document also acknowledges that the priority for tribes is not just trying to be useful for the national strategy, but that:

> "Monitoring priorities must be based on Tribal decisions, which in many cases involve developing a better characterization of local exposure to air pollutants."

The NAAMS mentions the benefits of the TAMS center in Las Vegas, NV. This center for tribal air work is an important tool for the tribes. It helps the tribes in many ways to deal with their ambient air monitoring.

The NAAMS mentions the RPO's in integrating tribes into larger air monitoring strategies. The RPO's help tribes and states work on air issues, it brings them together for work on air monitoring. There must be team work on all levels to preserve air quality.

The NAAMS document recognizes that tribes will benefit by being able to identify threats to health. Tribes must be able to deal with air monitoring on tribal lands. Tribes do not trust the states or the Federal government to do this for them because of past historical experience. But the basic fact is that the Federal government and the Environmental Protection Agency have written into its basis, the protection of the tribes.

The original Tribal Monitoring Strategy paper spoke of the Ncore strategy. As outlined in the Ncore strategy, finding a meaningful way to participate in that strategy is important. A tribal affiliated group, such as the Institute for Tribal Environmental Professionals (ITEP), should be identified to do the "representativeness" analysis for all tribes, in certain regions of the US. Identifying those tribes that is not currently represented by the Ncore network should be made. These tribes should have access to the regional air monitoring data to see the status of their air quality. This project should also be aimed at locating tribes that would serve to fill data gaps, and those that have air pristine enough to provide background conditions. A perfect example of how this could be performed is when ITEP worked with the Western Regional Air Partnership (WRAP).

Below is a template for this process. It discusses how ITEP worked with tribes in the West to uncover these tribal issues. Perhaps this template could be used over the entire US:

> In 1996, the Grand Canyon Visibility Transport Commission (GCVTC, the predecessor to WRAP) identified a need for emissions inventories and air monitoring on and near tribal lands in the Western USA. We need to do this Nation wide for all tribes. This western US project, funded by the Western Regional Air Partnership's (WRAP) Tribal Data Development Working Group (TDDWG), served as a first step in gathering existing information on tribal air quality in the WRAP region. This is an important template for all of the US. The purpose of this project was to assess the current state of tribal air quality data and programs in the WRAP region and to clarify future needs in tribal air quality data development. The information collected and summarized is meant to inform the committees on the magnitude of the gap in air quality data over tribal lands, in the West. It is also meant to provide a starting point for planning future data development efforts in Indian Country, all over the USA.

Several critical issues were identified through this project, they include:

- A serious limitation on environmental program resources among the WRAP tribes.
- A high demand for new and continuing tribal air quality programs in the WRAP region.
- A shortage of tribal staff to deal with air quality issues.

The following will describe how these issues were identified and could be a template for how this could be accomplished all over the USA.

ITEP was contracted to gather information on tribal air programs in the WRAP region for this project. ITEP compiled a list of the 237 federally recognized tribes in the WRAP region, along with environmental and/or air program contacts for each of the tribes. ITEP attempted to contact 220 of these tribes and 156 tribes completed the assessment instrument. ITEP staff persons were assigned to make all of the contacts.

One of the critical findings of ITEP's inquiries was a serious limitation on environmental program resources among the WRAP tribes. This is true all over the US. Information gathered in 2001, for the western states indicated that only 22% of the 156 tribes it contacted are currently involved in the WRAP. Of those not currently involved in the WRAP, 41% indicated that they were not involved due to lack of staff and/or resources. Twenty-five percent (25%) said that they were not aware of the WRAP prior to the ITEP phone call. This data suggests a need for a more active outreach program for tribes. This is true all over the US.

The shortage of tribal staff to deal with air quality issues was apparent in every phase of the WRAP project. It was difficult to schedule meetings due to tribal staff's full

schedules. Additional staff in tribal air programs would increase the quality and quantity of tribal air programs, as well as provide tribal staff with time for informed and meaningful participation in air monitoring work.

Research also revealed a high demand for new and continuing tribal air quality programs in the WRAP region, and across the USA. When asked if the tribe had an air program, 38% (60 tribes) said that they did. The other 96 tribes indicated that they did not have an air program. Planning to meet the demands for tribal air programs should be underway, not only for these new tribes but for the tribes that have been found to be seriously understaffed**.** As more tribes endeavor to assess, monitor and protect their air quality, additional resources must be identified to support quality tribal air programs.

Many tribes in the WRAP region effect air quality through prescribed burning programs. One hundred fifty-six (156) tribes were asked if prescribed burning occurred on their reservation. Approximately half (76) of the tribes responding said that prescribed burning did occur on their reservation. An additional 14 tribes, who do not currently use prescribed burns, indicated that they plan to use them in the future. This information indicates that tribes should play an integral part in regional planning of fire emissions. Air monitoring is important where use of fire occurs often. This happens on tribal lands, and monitoring of the air is an important issue for tribes concerned with human health. This project identified several challenges and opportunities for tribal air quality programs in the Western USA, and could be used as a template all over the USA.

[The coordinator/authors for this section may choose to convey the tribal perspective by the use of delineated text blocks within other individual sections as well as including this section.]

Appendix A
Examples of Tribal Air Monitoring

Name of Monitoring Project

Tribe

Project Objectives

Pollutants Monitored

Description of the Project (include budget information)

Quality Assurance

Data Analysis/Assessment

Results/Conclusions/Outcomes

Appendix B
Tribal Air Monitoring Guidance Document
Proposed Revision to Table of Contents

Old § No.

Appendix C
Examples of Tribal Air Monitoring
Examples of Tribal Air Monitoring Projects

Name of Project	**Tribe**	**Project Objectives**	**Pollutants Monitored**	**Description of Project/Budget**	**QA Plan? (yes/no)**	**Location of Data**	**Data Analysis/Assessment**	**Results/Conclusions/Outcomes**
Sioux Manufacturing Air Toxics Monitoring Project	Spirit Lake Tribe, Fort Totten, ND	Measure ambient air toxics in proximity of manufacturing plant and community	VOCs and Carbonyls using UATMP canisters and Puf sampler, met monitor		Yes		EPA reviewed data that was supplied by monitoring completed by Tribe and analyzed by EPA contractor, compared values to IRIS RfC	Monitored HAPs were far below RfCs for inhalation. Tribe wishes to conduct follow-up short-term project after installation of controls at source.